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PORTABLE FIRE-WEATHER STATION

INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
Forest Service
United States Department of Agriculture
Ogden, Utah
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THE PORTABLE FIRE-WEATHER STATION

General Information

The portable fire-weather station is designed to give complete fire-weather information at prescribed burns, going fires, and other special administrative and research locations (fig. 1 and 2). The unit houses instruments to measure rainfall, wind velocity, maximum and minimum temperatures, wet and dry bulb temperature, and fuel moisture.

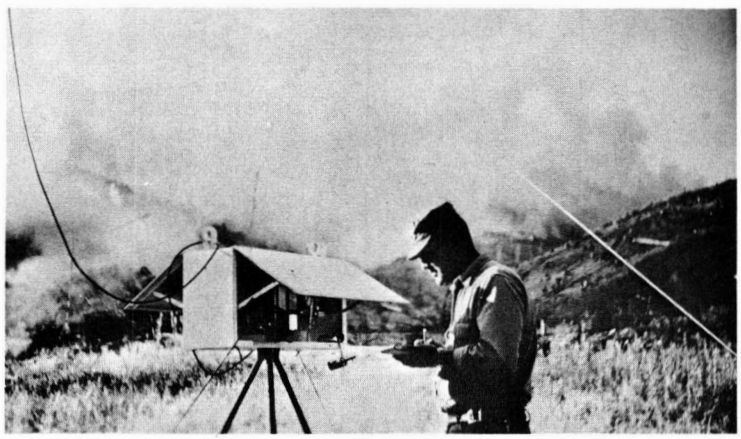

Figure 1. Station used on a prescribed burn.

Figure 2. Station used at a test plot.

The housing and telescoping tubing mast are aluminum. Thus the unit is lightweight and strong. Completely equipped, the station weighs about 36 pounds.

The portable station is designed to be set up quickly and easily. Because it is portable, the unit can be used at the most remote and inaccessible locations. It can be back-packed, hand-carried, or dropped by parachute (fig. 3, 4, 5, and 6).

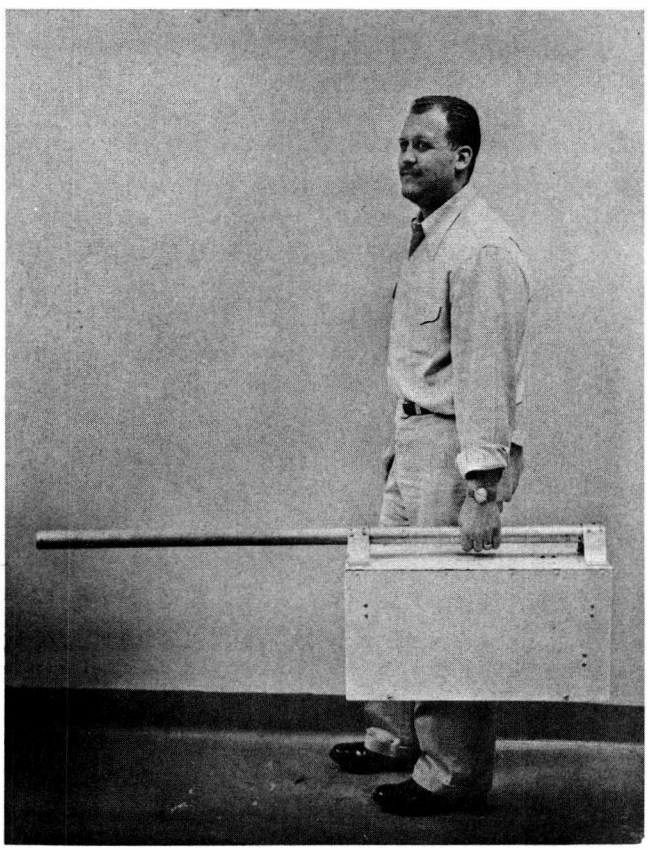

Figure 3. Station being hand-carried.

Figure 4. Station being back-packed.

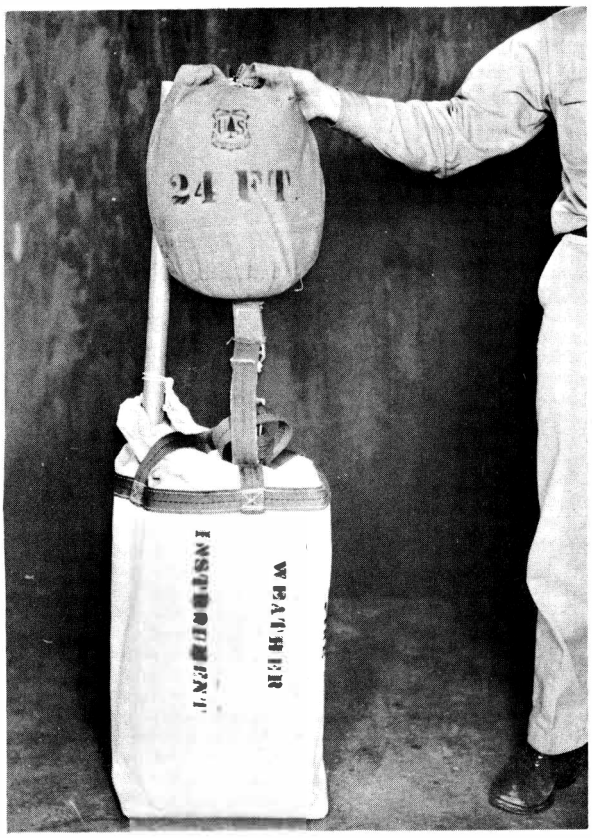

Figure 5. Station packaged for air-dropping with a 24-foot parachute.

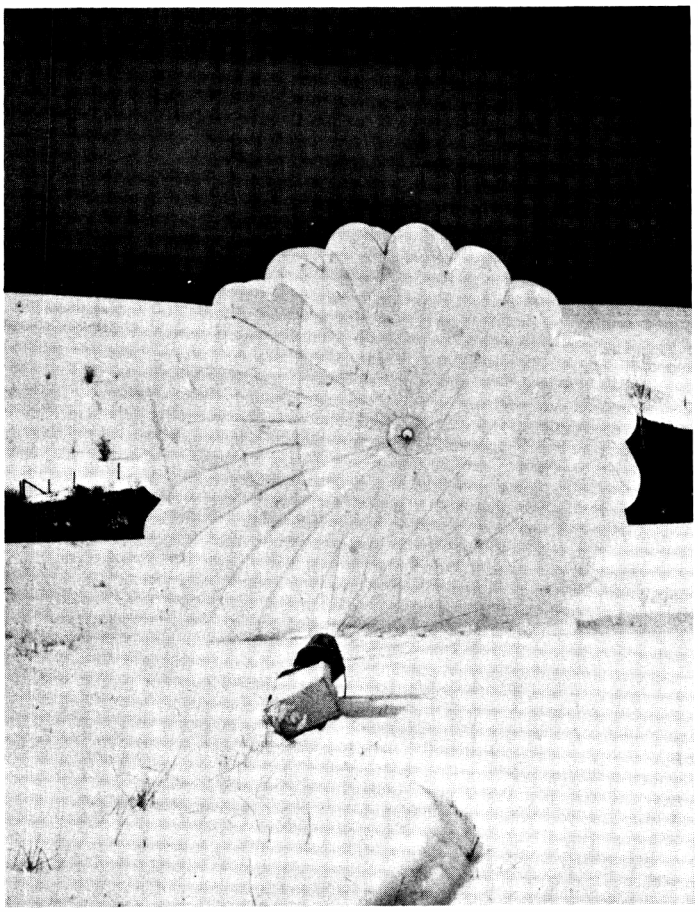

Figure 6. Station after landing from test drop.

Setting up the Station

When setting up the portable fire-weather station, remove the locking bolt on the strap and slide the tubing out (fig. 7). The 20-foot anemometer mast is made of six lengths of telescoping aluminum tubing from 3/4 to 1-3/8-inch diameter. These tubes are carried in the protective casing just removed.

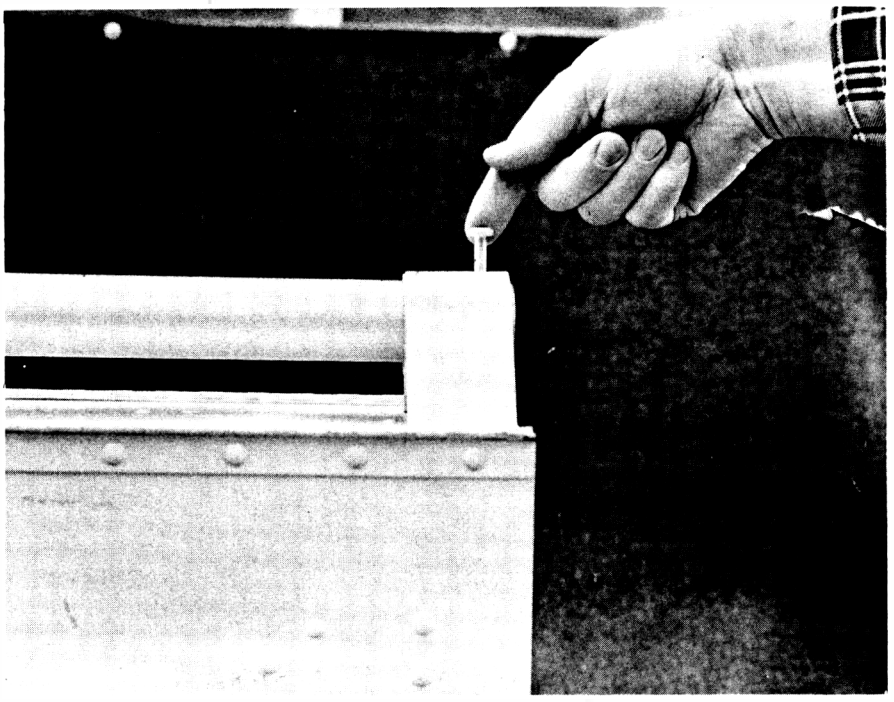

Figure 7. Remove locking bolt from strap.

Take the screwdriver and open the front panel by turning the fasteners a half-turn counterclockwise. The screwdriver is locked into place by the protective casing until the casing is removed. The front panel will open fully to allow easy access to the instruments.

Unsnap the spare parts bag in the base of the station and remove it and the folder. Empty the bag and folder (fig. 8). Notice that detailed instructions for setting up the station are in the folder. Also, the Fire-Weather Handbook is in the folder, and this handbook contains complete information on methods of observation as well as care and repair of weather instruments.

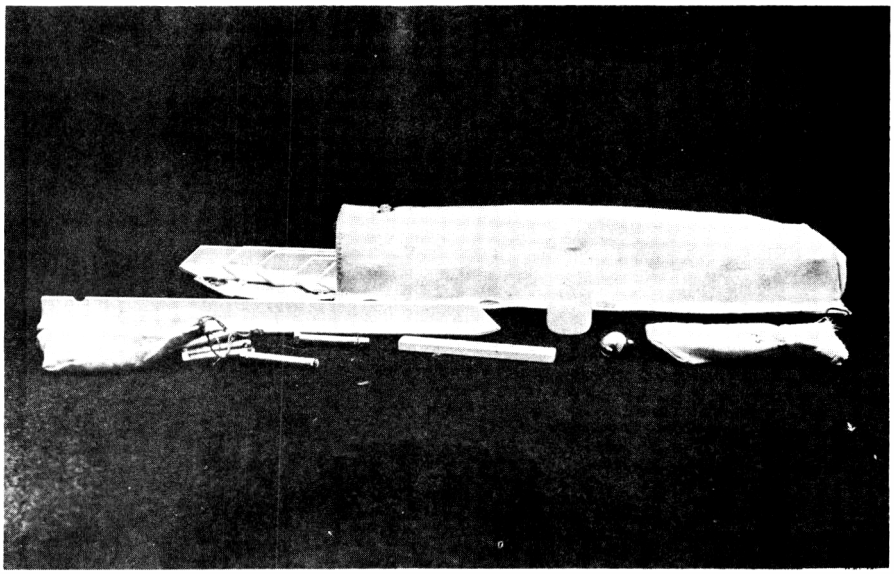

Figure 8. Spare parts bag containing stakes, bolts, water bottle, and rope tightener.

Remove the plastic rain gage from the roof of the housing and attach it to the outside clip (fig.9). This rain gage is calibrated in one-hundredths of an inch of rainfall.

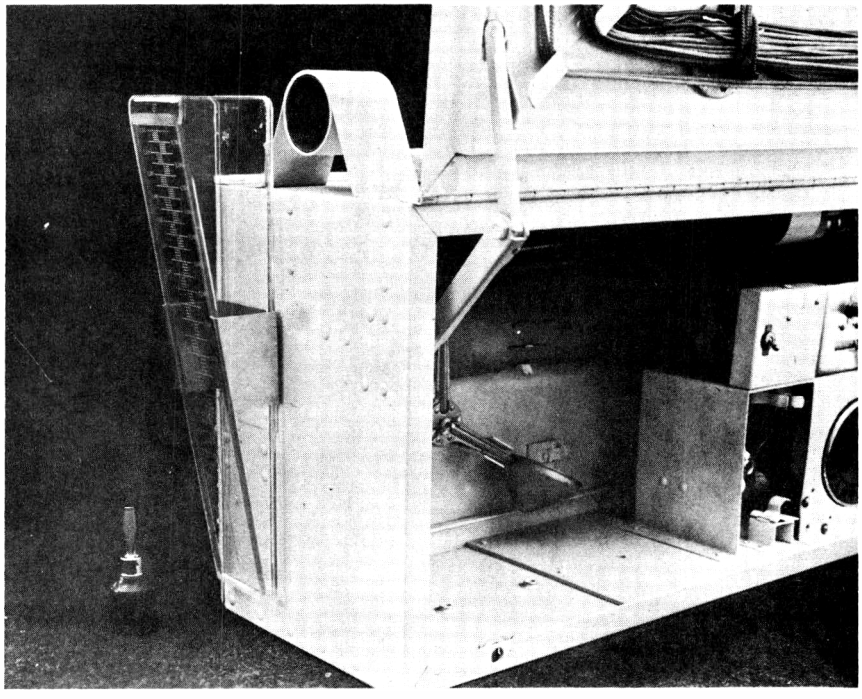

Figure 9. Rain gage attached to clip on left side of station. Open front panel to right.

Remove the tripod, extend the legs, and set the locking rings firmly but not too tight. Note that the plastic rain gage is removed first to prevent damage, and it is assembled in the reverse order. Take the bolt from the spare parts bag and attach the tripod to the housing. The 1/8-inch plate in the base of the housing prevents buckling and wobbling.

Remove the pocket psychrometer case and hang the psychrometer tubes on the hook (fig. 10). Then snap the frame into the clamp (fig. 11). The aspirator fan moves the air past the wicking.

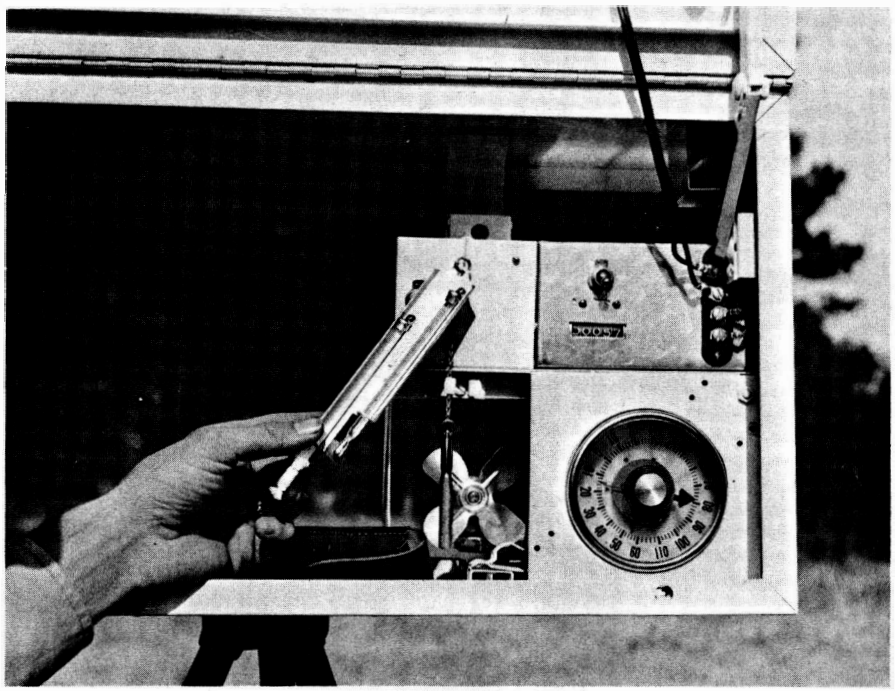

Figure 10. Psychrometer hung on hook. Clamp directly below hook.

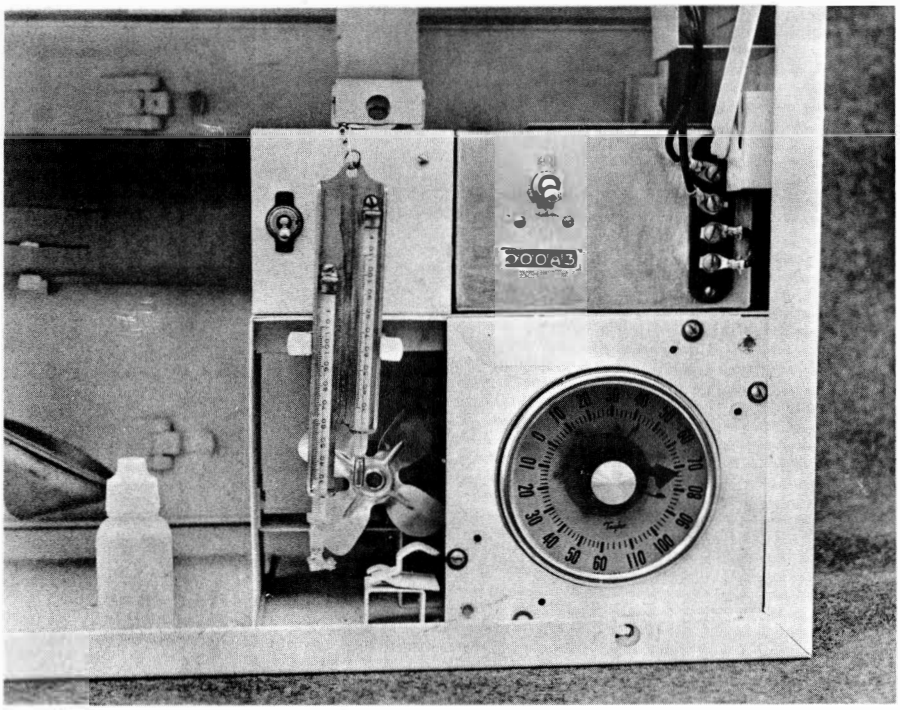

Figure 11. Psychrometer in clamp. Switch for fan to left of hook. Wind counter in upper right and maximum-minimum thermometer below.

Open the rear panel by turning the fasteners one-half turn counter-clockwise. This panel will only open 60 degrees from the closed position. This is the proper angle for both panels to be set when the station is set up for operation (fig. 12).

Figure 12. Proper way to leave side panels after observation.

Unscrew the anemometer cup assembly from the rear panel (fig. 13). The anemometer is packaged in two parts, the cup assembly and the housing.

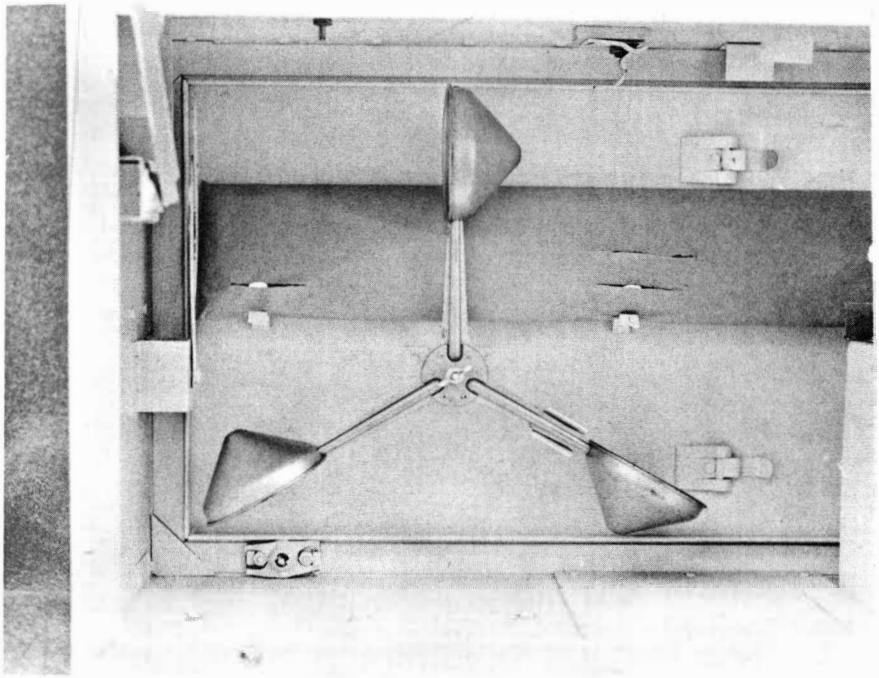

Figure 13. Anemometer cup assembly held by screw and clamp on rear panel.

Remove the fuel moisture scale (next to battery case) by unscrewing the wingnut, removing the bolt, and pivoting the bracket away from the scale. The station is designed to carry an Appalachian scale on the rear panel if preferred. Remove the fuel moisture sticks and place in a proper location. (See Fire-Weather Handbook.)

Remove the anemometer housing from its clamp and assemble the anemometer. Make sure the cups move freely.

Remove the telescoping tubing from its protective casing. Extend the tubes and put a bolt through the aligned holes at each joint. There are five joints. Put a retainer pin through the end of each bolt to prevent its sliding out (fig. 14). The mast telescopes from approximately 4 feet to 19 feet, 6 inches.

Figure 14. Bolt through the two smallest tubes with retainer clamp.

Unwind the guy ropes and the anemometer lead wire. Put the guy ring just above the bolt at the second joint from the top. Then put the anemometer on the tapered end of the smallest tube and tighten the set screw (fig. 15).

Figure 15. Tighten set screw to hold anemometer on smallest tube.

Attach the anemometer lead wires to the anemometer housing; the other ends are already connected to the totalizing wind counter. Test the anemometer and counter by turning the counter switch on and spinning the cups.

Put the base cap on the bottom of the mast. Drive three stakes about 12 feet from the spot chosen for the base of the mast and space them about 120 degrees apart. Hook the guy ropes to the stakes and erect the mast. Use the rope tighteners to tighten the guy ropes (fig. 16).

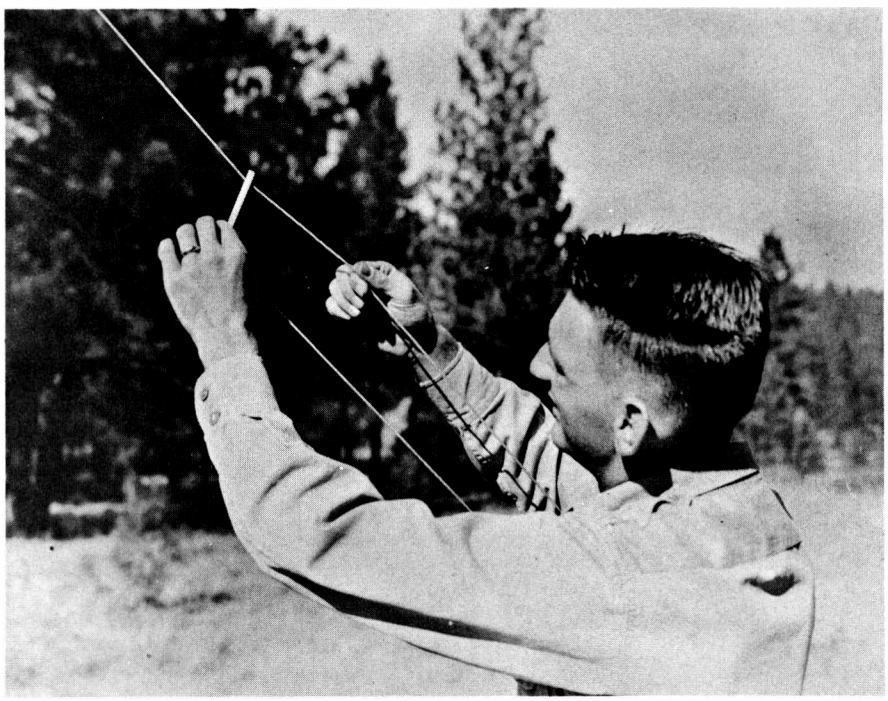

Figure 16. Proper method of using rope tighteners. Push with left hand; pull with right.

Swing the station until the rain gage is south. Place the "S" hooks in the lower diagonal corners of the housing (fig. 17). Drive the metal stakes about 4 feet from the corners of the station, attach the guy ropes, and tighten (fig. 18). Be certain the portable station is steady and level.

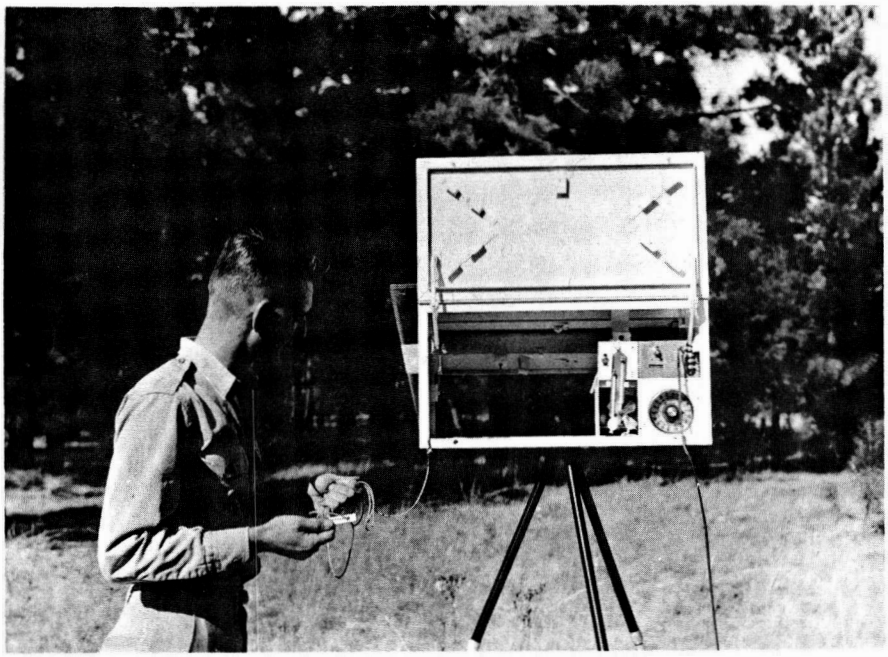

Figure 17. Placing "S" hooks in corners of station.

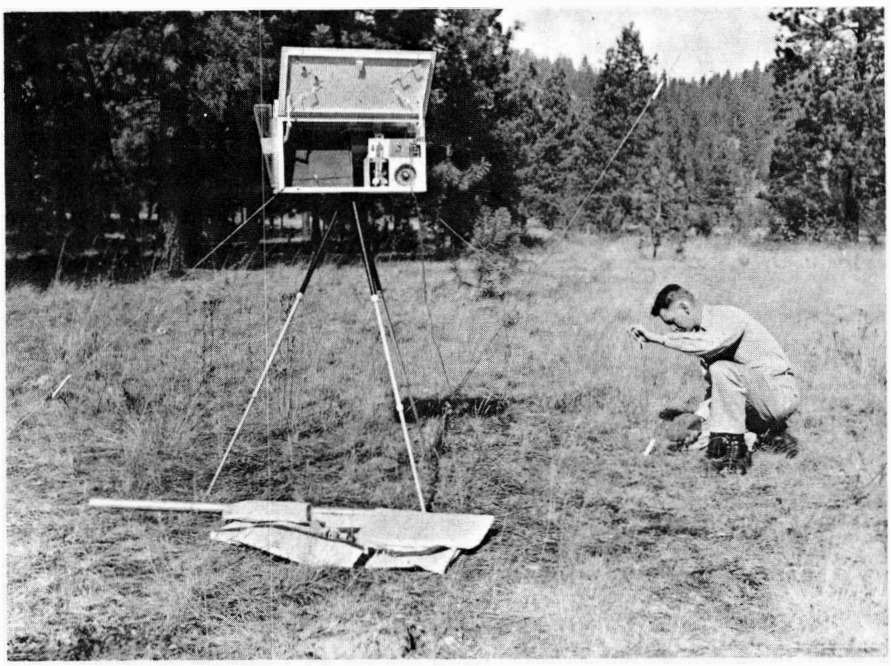

Figure 18. Driving stakes 4 feet from corners of station, connecting ropes and tightening. Note protective casing and spare parts bag on parachute bag.

The portable fire-weather station is now set up and ready for use.

Method of Using the Portable Fire-Weather Station

The station has a plastic rain gage to measure rainfall, a psychrometer and aspirator fan to measure relative humidity, a 3-cup anemometer and a totalizing wind counter to measure average wind velocity, a maximum-minimum thermometer to measure high and low temperatures, and fuel sticks and a scale to measure fuel moisture.

In order to use the station fully, record the fire weather information daily. In some cases the field situation may require several readings per day.

The instruments should be used as follows:

1. Read the rain gage to the nearest 1/100 inch. Empty contents after each observation.

2. Read the maximum-minimum temperature where the red pointers indicate on the circular scale. Use the knurled knob to reset the maximum-minimum by turning the pointers back to the current temperature reading.

3. Remove the scale from its housing by unscrewing the knurled knob. The scale reads directly in percentage moisture, since the sticks weigh 100.0 grams ovendry and the scale reads weight over 100.0 grams. Hang the fuel sticks on the hook, balance the scale and record the moisture. (For Appalachian slats: the scale can only be used if their net weight is over 100.0 grams. Balance and read the scale, add 100.0 grams, and divide this total by the ovendry weight of the slats.) Replace the scale in its housing. Place the sticks in the chosen location. Note that the portable station does not have a screen; a minimum amount of weathering on the fuel sticks should roughly compensate for exposing them unscreened.

4. Wet the wicking on the thermometer tube. Turn the fan on and record both wet and dry bulb temperature when the wet bulb temperature is as low as it will get. Turn the fan off and put the water bottle back in the spare parts bag. Use the psychrometric tables or slide rule to obtain relative humidity.

5. Read the numbers on the wind counter and record the time. Turn the counter on and let it run for the desired length of time. A minimum of 2 minutes is recommended; several hours is better. Then turn the counter off, record the time and the new set of numbers. The difference of numbers (or the elapsed count) divided by the elapsed time in minutes will give the average wind in miles per hour.

Figure 19. Balancing the scale to record fuel moisture.

Figure 20. Recording the average wind, the wet and dry bulb temperature and the maximum-minimum temperatures.